

**REMARKS**

Claims 1 and 3-13 are pending in this application. Claims 1, 3, 6, 9, and 11 are herein amended. Claims 7 and 8 are herein cancelled. New claims 14-16 are herein added. No new matter has been added.

Support for newly amended claim 1 may be found within the original specification, for example, page 8, line 35 to page 9, line 7.

Support for newly amended claim 6 may be found within the original specification, for example, original claims 1, 6, 7 and 8. .

Claims 9 and 3 are herein amended for further clarification.

Claim 11 is herein amended to encompass the water-based metal working oil comprising water and the lubricant.

Support for newly added claims 14-16 may be found within the original specification, for example, claims 11-13.

**Claim Rejections – 35 U.S.C. §103**

Claims 1 and 3-13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hashimoto et al, U.S. Patent No. 6,383,991 (hereinafter referred to as Hashimoto) in view of Takeshi et al, JP Publication No. 2002-69470 (hereinafter referred to as Takeshi). Applicants respectfully traverse this rejection.

Prior to addressing the Examiner's specific rejection, Applicants have prepared the following brief summary to further assist the Examiner in understanding Applicants' invention.

The presently claimed composition is a lubricant for water-based metal working oil containing polyether (E) represented by the following formula (1),  
$$R^1[\{(OCH_2CH_2CH_2CH_2)_m/(OA^1)_n\}(OA^2)_p-OH]_q.$$

In formula (1),  $R^1$  denotes a residue such that at least one hydroxyl group is removed from a compound with a carbon number of 1 to 24 having 1 to 6 hydroxyl group(s),  $A^1$  and  $A^2$  each denotes an ethylene group or a 1,2-propylene group,  $m$  denotes an integer of 1 or more having an average of 1 to 120,  $n$  and  $p$  each denotes an integer of 0, 1 or more such that an average of  $(n+p)$  is 1 to 200,  $n$  or  $p$  is 0, and  $n$  and  $p$  are not simultaneously 0,  $q$  denotes an integer of 2 or 3, and  $\{(OCH_2CH_2CH_2CH_2)_m/(OA^1)_n\}$  in a case where  $n$  is an integer of 1 or more denotes a random addition.

Generally, addition polymerization using two or more kinds of alkylene oxides (AO) include a “random addition” and a “block addition”. In the random addition, for example, two kinds of AO are both added to an alcohol in the presence of a catalyst. On the other hand, in the block addition, for example, a first AO is subject to homopolymerization with an alcohol in the presence of a catalyst, and after completing the homopolymerization of the first AO, a second AO is further added thereto in the presence of a catalyst. See patent application specification, page 8, line 35 to page 9, line 14.

In claim 1 of the presently claimed composition, the bonds between  $R^1$ ,  $-OCH_2CH_2CH_2CH_2$  (1, 4-butylene oxide) and  $-OA^1$  are formed by the following process:

- (i) at first either one oxyalkane group or one OA<sup>1</sup> group attacks on the oxygen atom on the residue of R<sup>1</sup> alcohol, and produces a new terminal oxygen bond; and
- (ii) from there, other oxyalkane groups and OA<sup>1</sup> groups are added to newly-created terminal oxygen at random.

This is clear to one skilled in the art because a polyether (El) was obtained by adding two kinds of AO (tetrahydrofuran (THF) and ethylene oxide (EO)) to an aliphatic alcohol with BF<sub>3</sub>·THF. See Applicants' specification, page 19, lines 12 to 21.

Therefore, one of ordinary skill in the art would understand that “{(OCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>)<sub>m</sub>/ (OA<sup>1</sup>)<sub>n</sub>}” of the claimed formula means a random addition.

Turning to the Examiner's specific rejection, Hashimoto discloses an oil composition comprising a polyether compound represented by the following formula (2): R<sub>1</sub>O (EO)<sub>m</sub> (AO)<sub>n</sub>R<sub>2</sub>, wherein each of R<sub>1</sub> and R<sub>2</sub>, may be identical or different, is a hydrogen atom or a hydrocarbon group having 1 to 24 carbon atoms, at least one of which is a hydrocarbon group; EO is oxyethylene group; AO is an oxyalkylene group having 3 or 4 carbon atoms; and each of m and n is 1 to 50, wherein a sum of m and n is from 4 to 100.

When R<sub>1</sub> is a hydrogen atom, R<sub>2</sub> is a hydrocarbon group, and AO is OCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub> group in the above formula (2), the polyether compound is HO(EO)<sub>m</sub> (CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O)<sub>n</sub>R<sub>2</sub>. This formula and the Applicants' claimed formula are the similar when p is zero and q is 1 in the above formula (1).

However, in claim 1 of the presently claimed composition, q is 2 or 3. Since Hashimoto only disclose q=1 and provides no disclosure, teaching, suggestion or provides any reasoning for having a q of 2 or 3, Hashimoto does not render obvious the polyether embodiment of the presently claimed composition.

Additionally, Hashimoto does not disclose a specific example of the polyether compound, HO(EO)<sub>m</sub> (CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O)<sub>n</sub>R<sub>2</sub>. See Hashimoto, Col. 9, lines 10 to 27. Furthermore, Hashimoto discloses that the polyether compound represented by the formula (2) can be obtained by adding an alkylene oxide compound to a monohydric alcohol or phenol using, for example, KOH as a catalyst. See Hashimoto, Col. 3, lines 15-18.

Here, it is well known to one of ordinary skill in the art that KOH cannot be used as a catalyst for a random addition of CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O and EO. The specification of the present patent application describes that there are different kinds of catalyst for a THF/AO random addition and an AO addition. An example of the catalyst for the THF/AO random addition is Lewis acid, such as BF<sub>3</sub>·THF, and an example of the catalyst for the AO addition is a hydroxide of alkali metal, such as KOH. See Applicants' specification, page 9, line 21 to page 10, line 15. Additionally, AO used for the AO addition includes 1, 2-butylene oxide and 2, 3-butylene oxide, both of which are branched AOs. See Applicants' specification, page 9, lines 18 to 20.

Therefore, the AO disclosed in Hashimoto cannot be a linear oxybutylene group, such as CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O, but must be a branched oxybutylene group, such as 1, 2-butylene oxide and 2,3-butylene oxide.

Moreover, it is considered that the polyether compound, including the branched oxybutylene group, is inferior in lubricity to the polyether compound, including the linear oxybutylene group.

Applicants have prepared and submitted experimental data proving that KOH cannot be used as a catalyst for a THF/AO random addition and that a polyether compound that includes a branched oxybutylene group is inferior. See the attached §132 Declaration by Tsuyoshi Okamoto.

As set forth in further detail in the §132 Declaration, one can see that when KOH is used as a catalyst for a THF/AO random addition, the polymerization of the THF is not substantially found and polyether is not obtained. In Comparative Examples E'4 and E'5 of the Declaration, one can see that when KOH is used, there is no polymerization of the THF. However, when KOH is not used as a catalyst, as in Examples E2 and E5, there is a BF<sub>3</sub>THF polymerization of 12.8 and 19.1, respectively.

Furthermore, the water dilution stability and lubricity was unexpectedly affected by the composition of the polyether present in the water-based metal working oil. In a polyether compound that includes a branched oxybutylene group, the lubricity to aluminium plate, the friction coefficient is 0.175 to 0.182 and in lubricity to a steel plate, the friction coefficient is

0.173 to 0.179. However, in a polyether compound that includes a linear oxybutylene group, the lubricity to aluminium plate, the friction coefficient is 0.093 to 0.095 and in lubricity to a steel plate, the friction coefficient is 0.073 to 0.075. See the §132 Declaration by Tsuyoshi Okamoto.

Thus, KOH cannot be used as a catalyst for a THF/AO random addition and a compound that includes the branched oxybutylene group is inferior in lubricity to the polyether compound that includes the linear oxybutylene group.

Accordingly, it would not be obvious to one of ordinary skill in the art to make or use the claimed  $\text{HO}(\text{EO})_m(\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{O})_n\text{R}_2$  compound in a lubricant for water based metal working oil, at the time of the invention, in view of Hashimoto.

Takeshi discloses a lubricant base oil for use as a metal working fluid containing polyether with a weight-average molecular weight between 500 to 10,000 and an HLB of 8.5 or more. See Takeshi, paragraph [0004]. However, even if one of ordinary skill in the art uses a polyether surfactant of Hashimoto with a HLB within the range of Takeshi, one of ordinary skill in the art would not obtain the presently claimed composition. Takeshi does not overcome the deficiencies in the prior reference, Hashimoto. Thus, the presently claimed composition is not obvious in view of Hashimoto and Takeshi.

Furthermore, Hashimoto in view of Takeshi does not render claims 3 to 5 obvious. In addition, independent claims 6, 11 and 14, and their dependent claims 7 to 10, 12, 13, 15 and 16 are also patentable because claims 6, 11 and 14 include the presently claimed lubricant composition, as recited in claim 1.

Application No.: 10/550,028  
Art Unit: 1797

Amendment Under 37 CFR §1.111  
Attorney Docket No.: 053044

Favorable reconsideration is earnestly solicited.

**The Double Patenting Rejection**

Claims 1 and 4-6 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2 of copending Application No. 11/569,916.

Since this is a provisional rejection, Applicants are postponing their response until the instant application or the copending application is in condition for allowance. See MPEP §804.I.B

In view of the above, Applicants respectfully submit that their claimed invention is allowable and ask that the rejection under 35 U.S.C. §103 be reconsidered and withdrawn. Applicants respectfully submit that this case is in condition for allowance and allowance is respectfully solicited.

If any points remain at issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the local exchange number listed below.

Application No.: 10/550,028  
Art Unit: 1797

Amendment Under 37 CFR §1.111  
Attorney Docket No.: 053044

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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LCW/BKM/bam

Attachment: Declaration under 37C.F.R§1.132